

Claims

- [c1] 1. A system for cleaning a hot heat-exchange device, comprising:
at least one explosive material;
a tubular device freely positioned into the hot heat-exchange device, enabling said at least one explosive material to be introduced into the hot heat-exchange device and enabling said at least one explosive material to be positioned to a desired position within the hot heat-exchange device;
a coolant cooling said at least one explosive material, enabling said at least one explosive material to be introduced into the hot heat exchange device while remaining cool, non-destructively such that when said at least one explosive material is detonated, substantially all explosive impact is provided from said at least one explosive material; and
a detonator detonating said at least one explosive material at will.
- [c2] 2. The system of claim 1, said at least one explosive material introduced for cleaning once said coolant commences to cool said at least one explosive material.

- [c3] 3. The system of claim 1, said coolant cooling said at least one explosive material after said at least one explosive material is introduced for cleaning.
- [c4] 4. The system of claim 1, said coolant cooling said at least one explosive material while said at least one explosive material is introduced into the hot heat-exchange device.
- [c5] 5. The system of claim 1, said coolant cooling said at least one explosive material when said at least one explosive material at said desired position.
- [c6] 6. The system of claim 1, said coolant enveloping said at least one explosive material.
- [c7] 7. The system of claim 1, further comprising:
a coolant-delivery apparatus delivering said coolant proximate said at least one explosive material.
- [c8] 8. The system of claim 7, said coolant-delivery apparatus omitting any return flow of said coolant.
- [c9] 9. The system of claim 7, said coolant-delivery apparatus comprising at least one coolant delivery aperture delivering said coolant proximate said at least one explosive material.

- [c10] 10. The system of claim 7, further comprising:
a distance maintained between said coolant-delivery apparatus and said at least one explosive material.
- [c11] 11. The system of claim 9, wherein:
said at least one coolant delivery aperture is spaced from
said at least one explosive material when said at least
one explosive material is at said desired position within
said hot heat-exchange device.
- [c12] 12. The system of claim 7:
said coolant-delivery apparatus comprising said tubular
device; and
said tubular device comprising at least one passageway
for flowing said coolant through said tubular device.
- [c13] 13. The system of claim 1, further comprising:
an explosive material housing containing said at least
one explosive material; wherein
said coolant cools said explosive material housing.
- [c14] 14. The system of claim 13, said explosive material
housing introduced for cleaning once said coolant com-
mences to cool said explosive material housing.
- [c15] 15. The system of claim 13, said coolant cooling said
explosive material housing after said at least one explo-
sive material is introduced for cleaning.

- [c16] 16. The system of claim 13, said coolant cooling said at least one explosive material while said at least one explosive material is introduced into the hot heat-exchange device.
- [c17] 17. The system of claim 13, said coolant cooling said at least one explosive material when said at least one explosive material at said desired position.
- [c18] 18. The system of claim 13, said coolant enveloping said explosive material housing.
- [c19] 19. The system of claim 13, further comprising:
a protective envelope surrounding said explosive material housing with said coolant to cool said explosive material housing.
- [c20] 20. The system of claim 19, wherein said protective envelope is semipermeable.
- [c21] 21. The system of claim 13, further comprising:
a coolant-delivery apparatus delivering said coolant proximate said explosive material housing.
- [c22] 22. The system of claim 21, omitting any return flow of said coolant.
- [c23] 23. The system of claim 21, said coolant-delivery appa-

ratus comprising at least one coolant delivery aperture delivering said coolant proximate said at least one explosive material.

[c24] 24. The system of claim 21, further comprising:
a distance maintained between said coolant-delivery apparatus and said at least one explosive material.

[c25] 25. The system of claim 23, wherein:
said at least one coolant delivery aperture is spaced from said at least one explosive material when said at least one explosive material is at said desired position within said hot heat-exchange device.

[c26] 26. The system of claim 21:
said coolant-delivery apparatus comprising said tubular device; and
said tubular device comprising at least one passageway for flowing said coolant through said tubular device.

[c27] 27. A system for cleaning a hot heat-exchange device, comprising:
at least one explosive material;
a tubular device freely positioned into the hot heat-exchange device, enabling said at least one explosive material to be introduced into the hot heat-exchange device and enabling said at least one explosive material

to be positioned to a desired position within the hot heat-exchange device;
a coolant cooling said at least one explosive material, enabling said at least one explosive material to be introduced into the hot heat exchange device while remaining cool; and
a detonator detonating said at least one explosive material at will.

[c28] 28. The system of claim 27, said at least one explosive material introduced for cleaning once said coolant commences to cool said at least one explosive material.

[c29] 29. The system of claim 27, said coolant cooling said at least one explosive material after said at least one explosive material is introduced for cleaning.

[c30] 30. The system of claim 27, said coolant cooling said at least one explosive material while said at least one explosive material is introduced into the hot heat-exchange device.

[c31] 31. The system of claim 27, said coolant cooling said at least one explosive material when said at least one explosive material at said desired position.

[c32] 32. The system of claim 27, said coolant enveloping said at least one explosive material.

- [c33] 33. The system of claim 27, further comprising:
a coolant-delivery apparatus delivering said coolant proximate said at least one explosive material.
- [c34] 34. The system of claim 33, said coolant-delivery apparatus omitting any return flow of said coolant.
- [c35] 35. The system of claim 33, said coolant-delivery apparatus comprising at least one coolant delivery aperture delivering said coolant proximate said at least one explosive material.
- [c36] 36. The system of claim 33, further comprising:
a distance maintained between said coolant-delivery apparatus and said at least one explosive material.
- [c37] 37. The system of claim 35, wherein:
said at least one coolant delivery aperture is spaced from said at least one explosive material when said at least one explosive material is at said desired position within said hot heat-exchange device.
- [c38] 38. The system of claim 33:
said coolant-delivery apparatus comprising said tubular device; and
said tubular device comprising at least one passageway for flowing said coolant through said tubular device.

- [c39] 39. The system of claim 27, further comprising:
an explosive material housing containing said at least
one explosive material; wherein
said coolant cools said explosive material housing.
- [c40] 40. The system of claim 39, said explosive material
housing introduced for cleaning once said coolant com-
mences to cool said explosive material housing.
- [c41] 41. The system of claim 39, said coolant cooling said
explosive material housing after said at least one explo-
sive material is introduced for cleaning.
- [c42] 42. The system of claim 39, said coolant cooling said at
least one explosive material while said at least one ex-
plosive material is introduced into the hot heat-ex-
change device.
- [c43] 43. The system of claim 39, said coolant cooling said at
least one explosive material when said at least one ex-
plosive material at said desired position.
- [c44] 44. The system of claim 39, said coolant enveloping said
explosive material housing.
- [c45] 45. The system of claim 39, further comprising:
a protective envelope surrounding said explosive mate-
rial housing with said coolant to cool said explosive ma-

terial housing.

[c46] 46. The system of claim 45, wherein said protective envelope is semipermeable.

[c47] 47. The system of claim 39, further comprising:
a coolant-delivery apparatus delivering said coolant proximate said explosive material housing.

[c48] 48. The system of claim 47, omitting any return flow of said coolant.

[c49] 49. The system of claim 47, said coolant-delivery apparatus comprising at least one coolant delivery aperture delivering said coolant proximate said at least one explosive material.

[c50] 50. The system of claim 47, further comprising:
a distance maintained between said coolant-delivery apparatus and said at least one explosive material.

[c51] 51. The system of claim 49, wherein:
said at least one coolant delivery aperture is spaced from said at least one explosive material when said at least one explosive material is at said desired position within said hot heat-exchange device.

[c52] 52. The system of claim 47:
said coolant-delivery apparatus comprising said tubular

device; and

said tubular device comprising at least one passageway for flowing said coolant through said tubular device.

[c53] 53. A system for cleaning a hot heat-exchange device, comprising:
at least one explosive material;
a tubular device freely positioned into the hot heat-exchange device, enabling said at least one explosive material to be introduced into the hot heat-exchange device and enabling said at least one explosive material to be positioned to a desired position within the hot heat-exchange device;
a coolant cooling said tubular device, enabling said tubular device to remain cool while introducing said at least one explosive material into the hot heat-exchange device; and
a detonator detonating said at least one explosive material at will.

[c54] 54. The system of claim 53, said at least one explosive material introduced for cleaning once said coolant commences to cool said tubular device.

[c55] 55. The system of claim 53, said coolant cooling said tubular device after said at least one explosive material is introduced for cleaning.

- [c56] 56. The system of claim 53, said coolant cooling said tubular device while said at least one explosive material is introduced into the hot heat-exchange device.
- [c57] 57. The system of claim 53, said coolant cooling said at least one explosive material when said at least one explosive material at said desired position.
- [c58] 58. The system of claim 53:
said tubular device comprising at least one passageway for flowing said coolant, thereby cooling said tubular device.
- [c59] 59. The system of claim 53, omitting any return flow of said coolant.
- [c60] 60. The system of claim 53, said tubular device comprising at least one coolant delivery aperture delivering at least some coolant proximate said at least one explosive material.
- [c61] 61. The system of claim 53, further comprising:
a distance maintained between said tubular device and said at least one explosive material.
- [c62] 62. The system of claim 60, wherein:
said at least one coolant delivery aperture is spaced from said at least one explosive material when said at least

one explosive material is at said desired position within said hot heat-exchange device.

[c63] 63. A system for cleaning a hot heat-exchange device, comprising:
at least one explosive material;
a tubular device freely positioned into the hot heat-exchange device, enabling said at least one explosive material to be introduced into the hot heat-exchange device via said tubular device and enabling said at least one explosive material to be positioned to a desired position within the hot heat-exchange device;
a coolant for cooling said at least one explosive material while said least one explosive material is introduced into said hot heat-exchange device;
a coolant-delivery apparatus comprising at least one tubular passageway for flowing said coolant therethrough and delivering said coolant proximate said at least one explosive material; and
a detonator detonating said at least one explosive material at will.

[c64] 64. A system for cleaning a hot heat-exchange device, comprising:
at least one explosive material;
an explosive material housing containing said at least one explosive material;

a coolant for cooling said at least one explosive material while said at least one explosive material is introduced into the hot heat-exchange device;
a protective envelope surrounding said explosive material housing with said coolant;
a tubular device freely positioned into the hot heat-exchange device, enabling said at least one explosive material to be introduced into the hot heat-exchange device via said tubular device and enabling said at least one explosive material to be positioned to a desired position within the hot heat-exchange device; and
a detonator detonating said at least one explosive material at will.

[c65] 65. A system for cleaning a hot heat-exchange device, comprising:
at least one explosive material;
a tubular device freely positioned into the hot heat-exchange device, enabling said at least one explosive material to be introduced into the hot heat-exchange device via said tubular device and enabling said at least one explosive material to be positioned to a desired position within the hot heat-exchange device;
a coolant-delivery apparatus comprising at least one passageway for flowing at least some coolant therethrough and delivering said at least some coolant

proximate said at least one explosive material; and
a detonator detonating said at least one explosive material at will; wherein
at least some coolant envelopes said at least one explosive material to cool said at least one explosive material while said at least one explosive material is introduced into the hot heat-exchange device.

[c66] 66. A method for cleaning a hot heat-exchange device, comprising the steps of:
introducing at least one explosive material into the hot heat-exchange device and positioning said at least one explosive material to a desired position within the hot heat-exchange device, using a tubular device freely positioned into the hot heat-exchange device;
cooling, using a coolant, said at least one explosive material when introducing said at least one explosive material into the hot heat exchange device, non-destructively such that when said at least one explosive material is detonated, substantially all explosive impact is provided from said at least one explosive material, using a coolant cooling said at least one explosive material; and
detonating said at least one explosive material at will.

[c67] 67. The method of claim 66, further comprising the step of:
introducing said at least one explosive material for

cleaning once said coolant commences to cool said at least one explosive material.

[c68] 68. The method of claim 66, further comprising the step of:

cooling said at least one explosive material after said at least one explosive material is introduced for cleaning.

[c69] 69. The method of claim 66, further comprising the step of:

cooling said at least one explosive material while said at least one explosive material is introduced into the hot heat-exchange device.

[c70] 70. The method of claim 66, further comprising the step of

cooling said at least one explosive material when said at least one explosive material at said desired position.

[c71] 71. The method of claim 66, further comprising the step of:

enveloping said at least one explosive material with said coolant.

[c72] 72. The method of claim 66, further comprising the step of:

delivering said coolant proximate said at least one explosive material, using a coolant-delivery apparatus.

[c73] 73. The method of claim 72, further comprising the step of:
omitting any return flow of said coolant.

[c74] 74. The method of claim 72, further comprising the step of:
delivering said coolant proximate said at least one explosive material through at least one coolant delivery aperture of said coolant-delivery apparatus.

[c75] 75. The method of claim 72, further comprising the step of:
maintaining a distance between said coolant-delivery apparatus and said at least one explosive material.

[c76] 76. The method of claim 74, further comprising the step of:
providing a space between said at least one coolant delivery aperture and said at least one explosive material when said at least one explosive material is at said desired position within said hot heat-exchange device.

[c77] 77. The method of claim 72, said coolant-delivery apparatus comprising said tubular device, further comprising the step of:
flowing said coolant through at least one passageway of said tubular device.

- [c78] 78. The method of claim 66, further comprising the steps of:
providing an explosive material housing to contain said at least one explosive material; and
cooling said explosive material housing using said coolant.
- [c79] 79. The method of claim 78, further comprising the step of:
introducing said at least one explosive material for cleaning once said coolant commences to cool said at least one explosive material.
- [c80] 80. The method of claim 78, further comprising the step of:
cooling said at least one explosive material after said at least one explosive material is introduced for cleaning.
- [c81] 81. The method of claim 78, further comprising the step of:
cooling said at least one explosive material while said at least one explosive material is introduced into the hot heat-exchange device.
- [c82] 82. The method of claim 78, further comprising the step of
cooling said at least one explosive material when said at

least one explosive material at said desired position.

[c83] 83. The method of claim 78, further comprising the step of::

enveloping said at least one explosive material with said coolant.

[c84] 84. The method of claim 78, further comprising the step of:

cooling said explosive material housing using a protective envelope surrounding said explosive material housing with said coolant.

[c85] 85. The method of claim 84, wherein said protective envelope is semipermeable.

[c86] 86. The method of claim 78, further comprising the step of:

delivering said coolant proximate said at least one explosive material, using a coolant-delivery apparatus.

[c87] 87. The method of claim 86, further comprising the step of:

omitting any return flow of said coolant.

[c88] 88. The method of claim 86, further comprising the step of:

delivering said coolant proximate said at least one ex-

plosive material through at least one coolant delivery aperture of said coolant-delivery apparatus.

[c89] 89. The method of claim 86, further comprising the step of:

maintaining a distance between said coolant-delivery apparatus and said at least one explosive material.

[c90] 90. The method of claim 88, further comprising the step of:

providing a space between said at least one coolant delivery aperture and said at least one explosive material when said at least one explosive material is at said desired position within said hot heat-exchange device.

[c91] 91. The method of claim 86, said coolant-delivery apparatus comprising said tubular device, further comprising the step of:

flowing said coolant through at least one passageway of said tubular device.

[c92] 92. A method for cleaning a hot heat-exchange device, comprising the steps of:

introducing at least one explosive material into the hot heat-exchange device and positioning said at least one explosive material to a desired position within the hot heat-exchange device, using a tubular device freely po-

sitioned into the hot heat-exchange device;
cooling, using a coolant, said at least one explosive material when introducing said at least one explosive material into the hot heat exchange device; and
detonating said at least one explosive material at will.

[c93] 93. The method of claim 92, further comprising the step of:

introducing said at least one explosive material for cleaning once said coolant commences to cool said at least one explosive material.

[c94] 94. The method of claim 92, further comprising the step of:

cooling said at least one explosive material after said at least one explosive material is introduced for cleaning.

[c95] 95. The method of claim 92, further comprising the step of:

cooling said at least one explosive material while said at least one explosive material is introduced into the hot heat-exchange device.

[c96] 96. The method of claim 92, further comprising the step of

cooling said at least one explosive material when said at least one explosive material at said desired position.

[c97] 97. The method of claim 92, further comprising the step of:
enveloping said at least one explosive material with said coolant.

[c98] 98. The method of claim 92, further comprising the step of:
delivering said coolant proximate said at least one explosive material, using a coolant-delivery apparatus.

[c99] 99. The method of claim 98, further comprising the step of:
omitting any return flow of said coolant.

[c100] 100. The method of claim 98, further comprising the step of:
delivering said coolant proximate said at least one explosive material through at least one coolant delivery aperture of said coolant-delivery apparatus.

[c101] 101. The method of claim 98, further comprising the step of:
maintaining a distance between said coolant-delivery apparatus and said at least one explosive material.

[c102] 102. The method of claim 100, further comprising the step of:

providing a space between said at least one coolant delivery aperture and said at least one explosive material when said at least one explosive material is at said desired position within said hot heat-exchange device.

[c103] 103. The method of claim 98, said coolant-delivery apparatus comprising said tubular device, further comprising the step of:
flowing said coolant through at least one passageway of said tubular device.

[c104] 104. The method of claim 92, further comprising the steps of:
providing an explosive material housing to contain said at least one explosive material ; and
cooling said explosive material housing using said coolant.

[c105] 105. The method of claim 104, further comprising the step of:
introducing said at least one explosive material for cleaning once said coolant commences to cool said at least one explosive material.

[c106] 106. The method of claim 104, further comprising the step of:
cooling said at least one explosive material after said at

least one explosive material is introduced for cleaning.

[c107] 107. The method of claim 104, further comprising the step of:

cooling said at least one explosive material while said at least one explosive material is introduced into the hot heat-exchange device.

[c108] 108. The method of claim 104, further comprising the step of

cooling said at least one explosive material when said at least one explosive material at said desired position.

[c109] 109. The method of claim 104, further comprising the step of::

enveloping said at least one explosive material with said coolant.

[c110] 110. The method of claim 104, further comprising the step of:

cooling said explosive material housing using a protective envelope surrounding said explosive material housing with said coolant.

[c111] 111. The method of claim 110, wherein said protective envelope is semipermeable.

[c112] 112. The method of claim 104, further comprising the

step of:

delivering said coolant proximate said at least one explosive material, using a coolant-delivery apparatus.

[c113] 113. The method of claim 112, further comprising the step of:

omitting any return flow of said coolant.

[c114] 114. The method of claim 112, further comprising the step of:

delivering said coolant proximate said at least one explosive material through at least one coolant delivery aperture of said coolant-delivery apparatus.

[c115] 115. The method of claim 112, further comprising the step of:

maintaining a distance between said coolant-delivery apparatus and said at least one explosive material.

[c116] 116. The method of claim 114, further comprising the step of:

providing a space between said at least one coolant delivery aperture and said at least one explosive material when said at least one explosive material is at said desired position within said hot heat-exchange device.

[c117] 117. The method of claim 112, said coolant-delivery apparatus comprising said tubular device, further compris-

ing the step of:

flowing said coolant through at least one passageway of said tubular device.

[c118] 118. A method for cleaning a hot heat-exchange device, comprising:

introducing at least one explosive material into the hot heat-exchange device and positioning said at least one explosive material to a desired position within the hot heat-exchange device, using a tubular device freely positioned into the hot heat-exchange device;

cooling, using a coolant, said tubular device when introducing said at least one explosive material into the hot heat-exchange device; and

detonating said at least one explosive material at will.

[c119] 119. The method of claim 118, further comprising the step of:

introducing said at least one explosive material for cleaning once said coolant commences to cool said tubular device.

[c120] 120. The method of claim 118, further comprising the step of::

cooling said tubular device after said at least one explosive material is introduced for cleaning.

- [c121] 121. The method of claim 118, further comprising the step of:
cooling said tubular device while said at least one explosive material is introduced into the hot heat-exchange device.
- [c122] 122. The method of claim 118, further comprising the step of
cooling said at least one explosive material when said at least one explosive material at said desired position.
- [c123] 123. The method of claim 118, further comprising the step of:
cooling said tubular device by flowing said coolant through at least one passageway of said tubular device.
- [c124] 124. The method of claim 118, further comprising the step of:
omitting any return flow of said coolant.
- [c125] 125. The method of claim 118, further comprising the step of:
delivering at least some coolant proximate said at least one explosive material through at least one coolant delivery aperture of said tubular device.
- [c126] 126. The method of claim 118, further comprising the step of:

maintaining a distance between said tubular device and said at least one explosive material.

[c127] 127. The method of claim 125, further comprising the step of:

providing a space between said at least one coolant delivery aperture and said at least one explosive material when said at least one explosive material is at said desired position within said hot heat-exchange device.

[c128] 128. A method for cleaning a hot heat-exchange device, comprising the steps of:

introducing at least one explosive material into the hot heat-exchange device and positioning said at least one explosive material to a desired position within the hot heat-exchange device, via a tubular device freely positioned into the hot heat-exchange device;

cooling, using a coolant, said at least one explosive material when introducing said at least one explosive material into the hot heat exchange device;

delivering said coolant proximate said at least one explosive material by flowing said coolant through at least one tubular passageway of a coolant-delivery apparatus; and

detonating said at least one explosive material at will.

[c129] 129. A method for cleaning a hot heat-exchange device,

comprising the steps of:

providing an explosive material housing to contain said at least one explosive material;

cooling, using a coolant, said at least one explosive material when introducing said at least one explosive material into the hot heat exchange device;

surrounding said explosive material housing with said coolant, using a protective envelope;

introducing at least one explosive material into the hot heat-exchange device and positioning said at least one explosive material to a desired position within the hot heat-exchange device, via a tubular device freely positioned into the hot heat-exchange device;

detonating said at least one explosive material at will.

[c130] 130. A method for cleaning a hot heat-exchange device, comprising the steps of:

introducing at least one explosive material into the hot heat-exchange device and positioning said at least one explosive material to a desired position within the hot heat-exchange device, via a tubular device freely positioned into the hot heat-exchange device;

delivering said at least some coolant proximate said at least one explosive material, by flowing at least some coolant through at least one passageway of a coolant-delivery apparatus;

cooling said at least one explosive material while said at least one explosive material is introduced into the hot heat-exchange device, by enveloping said at least one explosive material with at least some coolant; and detonating said at least one explosive material at will.